CHITOSAN-BASED WOUND DRESSINGS PRODUCED BY ELECTROSPINNING

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Increasing attention has recently been paid to electrospinning (ESP); this process uses high voltage to create an electrically charged jet of polymer solution or melt which can lead to fibers formation. This technique allows the fabrication of polymer fibers ranging from nanometers to a few microns in diameter, depending on the polymer characteristics (a.o. molecular weight, solution viscosity and conductivity) and processing conditions (electric potential, distance between syringe-capillary and collection plate, concentration, flow rate)[1].

Mats of nanofibers produced by ESP method offer a very large surface area-to-volume ratio and high porosity with very small pore size. The nanometric scale of electrospun fibers also proves a positive effect on cellular growth, as fibers mats mimic extracellular matrix structure[1]. Biocompatible nanofibers might then be used in medical applications such as wound dressing, tissue engineering scaffolds or artificial blood vessels.

Among biocompatible polymers, chitosan – a natural polymer derived from the chitin shells of crustaceans or from mushrooms envelope – is particularly relevant; besides its biodegradable character, chitosan naturally presents haemostatic, mucoadhesive, antimicrobial and immunostimmulant properties [2]. These properties make chitosan an outstanding candidate for short- to medium-term biomedical and pharmaceutical applications.

In the present study, two different ways of producing chitosan-based fibrous wound dressings are reported: on the one hand, the direct electrospinning of chitosan was achieved. On the other hand, electrospinning was combined with layer-by-layer deposition technique, in order to prepare multilayered chitosan-based nanofibers. In this case, the prior electrospinning of an aliphatic polyester core, followed by the deposition of chitosan layer(s) on fiber surface, allows improving the mechanical properties of the resulting fiber mats. Indeed, chitosan presents poor mechanical resistance in aqueous medium whereas aliphatic polyester, biodegradable and biocompatible but hydrophobic, maintains its mechanical integrity in wet state.

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[2] M. Rinaudo, *Progress in Polymer Science*, **2006**, 31, 603-632.